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This grant was focused on studies of Saturn's satellites. The purpose of these studies was to identify characteristics of these objects that would merit detailed exploration by the CIRS instrument during the Cassini mission.

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"Participation in the Composite Infrared Spectrometer (CIRS) Project as Co-Investigator"

January 15, 1999 to January 14, 2000

Submitted by

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PROGRESS REPORT —CIRS

During the period under review, the work supported by this grant was focussed on studies of Saturn's satellites. The purpose of these studies was to identify characteristics of these objects that would merit detailed exploration by the CIRS instrument during the Cassini mission.

Following our previous work on the dark side of **Iapetus**, we are preparing a paper for publication. We have demonstrated that the ground-based observations can be satisfied with an intimate mixture of just three components: amorphous carbon, water ice, and processed organic material called Triton tholin. We have excluded contributions from polymerized HCN and hydrated silicates, two candidates proposed by earlier investigators. A key finding is that the organic material must be rich in nitrogen. This leads to the challenging hypothesis that this dark material might actually have been made on nearby **Titan**, and then blasted into space by a collision.

The relative abundance of nitrogen in this material can be tested by CIRS through observations in the 6mu region, which are impossible from the ground. The work also demonstrates the importance of CIRS observations of **Hyperion**, where a thinner coating of this same material may be present, especially if it originates on **Titan**.

We have also been preparing for the **Jupiter** encounter in December 2000, by examining previous observations of NH3 in the spectrum of this planet. It has become obvious that it is extremely important to record the spatial distribution of NH3 on Jupiter to see just how well-mixed this gas is, both horizontally and vertically at levels in the atmosphere corresponding to pressures around and below 1 bar. This is because of an apparent disagreement between ground-based microwave observations and the NH3 abundance deduced from the attenuation of the Galileo probe radio signal. It appears that this disagreement can be reconciled if NH3 is undersaturated in the 1 bar region over much of the planet, a possibility that CIRS can test. There is also the issue of the value of 14N/15N, which should be re-evaluated from the CIRS spectra, in view of the anomalously high value reported from ISO observations.

We are working with fellow members of the CIRS team to be sure that the necessary observations are included in the CIRS program.